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ABSTRACT

The reading difficulty levels of publications in five military occupational specialities (MOSs) were determined by the Flesch and Dale-Chall readability formulas. Readability levels were compared with the reading abilities of low and average mental aptitude men working in the MOSs. The comparison indicates that, in all MOSs, the average readability level of the publications exceeded the average reading ability of the low aptitude group by two to eight years. In all but one MOSs, average readability exceeded the average reading ability of the average group by one to six years. Evidence suggests that both high and low aptitude readers are hurt when the reading difficulty of materials is increased. (The document includes nine references, seven tables and figures, and procedures for deriving the Flesch index of readability.) (Author/LY)

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Literacy Demands of Publications in Selected Military Occupational Specialties

by

Thomas G. Sticht

1968-69 Briefings under
Work Unit REALISTIC

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Prefatory Note

This paper was prepared under Work Unit REALISTIC, Determination of Reading, Listening, and Arithmetic Skills Required for Major Military Occupational Specialties. The research was accomplished at the Human Resources Research Organization, Division No. 3 at Presidio of Monterey, California.

The author summarizes information presented at several briefings during 1968-69. Of concern is the reading difficulty level of Army publications in five Military Occupational Specialties, and discrepancies between the difficulty levels of the publications and the reading abilities of men in the MOSs.

LITERACY DEMANDS OF PUBLICATIONS IN SELECTED MILITARY OCCUPATIONAL SPECIALTIES

Thomas G. Sticht

INTRODUCTION

From time to time the minimal standards of mental aptitude required for acceptance into the Armed Services have been lowered. This action has inevitably been accompanied by an input of men into the services who are deficient in literacy skills. For example, recent statistics (1) indicate that 31% of the new personnel currently being accessioned into the military services under the standards of Project 100,000 read at or below the fourth-grade level of ability. Approximately 68% of these low aptitude men read at or below the sixth-grade level of ability.

The prospect of an influx of large numbers of lower aptitude men into the services under Project 100,000 has led to concern that the literacy requirements of many training and job positions might exceed the literacy skills of these men. Taking cognizance of this problem, and in keeping with the long range research plans of the Office of the Assistant Secretary of Defense (Manpower and Reserve Affairs) under Project 100,000, the Deputy Chief of Staff for Personnel, Department of Army, requested the Human Resources Research Organization to initiate Work Unit REALISTIC.

A general objective of REALISTIC is to determine reading, arithmetic, and listening skill levels required for satisfactory job performance in military occupational specialties (MOSs) into which many of the lower aptitude men can be expected to be assigned. A second general objective is to provide suggestions for reducing discrepancies between personnel literacy skills and levels of these skills required by various jobs. In this paper, the results of some early and partial data analyses relevant to the determination of reading requirements in five combat and combat support MOSs are presented.

RESEARCH APPROACHES FOR DETERMINING LITERACY REQUIREMENTS OF JOBS

Two different approaches for determining literacy requirements of Army jobs are being taken by REALISTIC. One approach consists of comparing performance on reading, listening, and arithmetic tests with performance on job sample tests. From these comparisons it should be possible to identify literacy skill levels adequate for performing at various levels of job proficiency. This approach and the date obtained therewith will be reported in detail in a future report.

A second approach for determining literacy requirements of different jobs consists of determining tasks which job incumbents perform using

either reading or arithmetic materials. Samples of these materials are then examined and classified with regard to the literacy or arithmetic skills called for by the material. At the present time the scheme for classifying materials according to their literacy requirements is undergoing development. However, one component of this scheme which is available and useful in determining the degree of difficulty of the literary style of printed materials is the readability formula. This paper presents the assessment of reading requirements for five MOSs as indicated by the readability of publications in these MOSs, and also compares the readability of these publications with the reading abilities of men working in the various MOSs. Data which indicate that discrepancies between the readability of publications and the reading abilities of personnel can lead to significant losses in comprehension are also presented. Also in this report are suggested applications of readability formulas in the quality control and design of printed materials as well as procedures and materials for computing the Flesch readability score.

THE MEASUREMENT OF READABILITY

The term "readability" refers to the comprehensibility of a publication--that is, how easy it is to read and understand the publication. Generally speaking, indices of readability are established by following three basic steps. *First*, a number of style factors, such as average sentence length, number of syllables per word, number of words occurring with low frequencies in general English usage, and so forth, are identified. *Second*, the number of occurrences of such factors in selected reading passages is correlated with performance on comprehension tests based on the passages. *Third*, regression equations are derived which state the functional relationships between the style factors and performance on the comprehension tests. Thus, a low readability score predicts a low level of comprehension of the passage, while a high readability score predicts a high level of comprehension of the passage.

In the present analyses, a modification of a formula devised by Flesch in 1948 (2) for the bulk of the assessment of reading difficulty of Army publications was used. This formula is: Readability = (1.599 x the number of one syllable words per 100 words in a sample of reading material) - (1.015 x the average sentence length, in words, of the sentences in the sample) - 31.517. This modified formula correlates better than .90 with Flesch's 1948 formula. The letter, in turn, has a validity coefficient of .70 for predicting the reading grade placement at which 75% comprehension of 100 word samples of the McCall-Crabbs *Standard Test Lessons* will occur (3, pp. 56-59). The "raw-score" index numbers derived with the use of the above formula "have a range from 0 to 100 for almost all samples taken from ordinary prose. A score of 100 corresponds to the predictions that a child who has completed fourth grade will be able to answer correctly three-quarters of the test questions to be asked about the passage that is being rated; in other words, a score of 100 indicates reading matter that is understandable for persons who have completed fourth grade and are, in the language of the U.S. Census, barely 'functionally literate'" (4, p. 225). In the present

research, the raw score indices obtained with the Flesch formula were converted directly into school grade equivalents by means of a specially prepared table (2).

A second readability formula, the Dale-Chall formula (5), was used to estimate the readability of a sub-sample of the materials evaluated by means of the Flesch formula. The Dale-Chall formula is determined by computing the average sentence length, in words, of sentences in 100 word samples of the material to be rated. Next the percentage of words outside the Dale list of 3,000 familiar words is computed. These figures are applied in a formula which provides the reading grade score of a pupil who could answer one-half the test questions on a passage correctly. The Dale-Chall formula scores correlate .70 with the McCall-Crabbs criterion scores. A number of comparisons of the Dale-Chall and Flesch formulas have consistently shown high correlations of these formulas, in some cases being as high as .98 (3, p. 118).

The Readability of Key Publications in Five MOSs

Estimates were obtained of the reading difficulty of major publications in MOSs 11E, Armor Crewman; 63C, General Vehicle Mechanic; 76Y, Unit and Organizational Supply Specialist; 91A, Medical Corpsman; and 94B, Cook. These MOSs were selected for research because of their involvement in HumRRO Work Unit UTILITY where job performance data are being collected for Category IV and Non-IV personnel in these combat and combat support MOSs. Data concerning literacy skills of personnel are being collected by Work Unit REALISTIC. With the information about personnel literacy skills, and the information concerning the readability of materials in these MOSs, it is possible to determine to what extent discrepancies exist between personnel reading skill levels, and the reading skill levels required for satisfactory comprehension of the job publications.

Criteria for the study of MOSs 11E, 63C, 76Y, 91A, and 94B in both Work Units UTILITY and REALISTIC include the following:

(1) These MOSs are high density for Category IV personnel, and adequacy of literacy and arithmetic skills are of special concern for these lower aptitude men.

(2) These MOSs have a degree of generality across the various armed services and civilian occupational specialties.

(3) These MOSs represent a wide range of military skill areas (e.g., Combat, Clerical, Technical, Mechanical) and literacy and arithmetic requirements as provided in AR 611-201.[1]

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[1]Department of the Army, *Manual of Enlisted Military Occupational Specialties*, Army Regulation (AR) 611-201, Washington, April 1966, with amendments.

The publications evaluated in each MOS were designated as either key publications, basic and essential to the adequate performance of the job, or as publications of general use to job personnel. This designation was accomplished by Army personnel serving as content experts for the preparation and administration of job performance tests in Work Unit UTILITY.

In evaluating the reading difficulty of each publication, a 10% sample of the pages in the publication was taken. For instance, if a publication contained 100 pages, then every 10th page was included in the sample. Only those pages that contained at least one sample of a 100-word section of connected discourse were used. Thus, if the 10th page contained only an illustration, one of the adjacent pages containing a 100-word sample of discourse was evaluated. All of the sampled pages were evaluated by means of the Flesch formula. The Dale-Chall formula was applied to an approximate 10% sub-sample of the sample. It was not applied to the entire sample because the determination of the words not included in the Dale list of 3,000 familiar words is a very time consuming process, and evidence exists to suggest that any possible gain in accuracy of the estimate of readability by the Dale-Chall formula does not justify the large increase in time required to apply the formula (3). Where the total sample was less than 10 pages, the Dale-Chall formula was applied to one page.

The publications evaluated for each MOS, and the results of the evaluations are given in Tables 1, 2, 3, 4, and 5. The number of pages sampled indicated in these tables refers to those evaluated by the Flesch formula. The range-of-difficulty levels of the sampled pages are estimates made with the use of the Flesch formula. The tables show a wide range of average readability levels, extending from 7th grade level (Flesch estimate) for the Armor Crewman TC 17-4 (Table 3) to beyond college graduate level in supply MOS 76Y (Table 1). While the Dale-Chall formula usually indicated a slightly higher level of readability than the Flesch formula, the correlation of the average readability scores obtained with these formulas was .84.

Figure 1 presents a summary of the data obtained with the Flesch formula for each MOS. The average grade level of readability of materials in each MOS is provided on the ordinate of this figure.

Included also in Figure 1 is an indication of the average reading grade level of ability of a sample of Army personnel working on jobs within each of the MOSs. Reading ability was assessed by means of the Survey of Reading Achievement, Junior High Level, California Test Bureau. The reading ability data are provided separately for lower aptitude men in mental Category IV and nonCategory IV men. Of interest are the discrepancies between the readability of materials, and the reading abilities of the men. As indicated below, these discrepancies are large enough to be especially important in MOSs 76Y, 63C, and 94B for high and low aptitude men and, additionally, in MOS 11E for low aptitude men.

The column at the right of Figure 1, presents the median reading ability of 46,000 new standards men (i.e., men accessed under Project 100,000 with AFQT scores in the 10-20 range). The column at the far

Table 1

Readability Scores for Army Publications in MOS 76Y: Unit and Organization Supply Specialist

Publication	Number of Pages Sampled	Range of Grade Difficulty Levels (Flesch Formula)	Average Grade Level (Flesch)	(Dale-Chall)
Army Regulation 735-5 Property Accountability	3	14.5-16+	16+	16+
Army Regulation 210-130 Laundry & Dry Cleaning	3	14.5-16+	16+	12.8
Army Regulation 735-11 Accounting for Lost, Damaged & Destroyed Property	12	14.5-16+	16+	16+
Army Regulation 700-8400-1 Issue & Sale of Personal Clothing	6	14.5-16+	16+	16+
Army Regulation 711-16 DSU/Installation Stock Control & Supply Procedures (Army Field Stock Control System)	8	14.5-16+	16+	16.8
Army Regulation 310-34 Organization & Equipment Authorization Tables, Equipment	2	14.5-16+	15+	16+
Army Regulation 711-5 Army Supply Status Reporting System; Unit, Organization, or Activity Equipment Status (Material Readiness)	4	16+	16+	16+
Army Regulation 735-10 Principles & Policies; Accounting for Lost, Damaged and Destroyed Property	1	16+	16+	16+
Army Regulation 735-28 Repairs & Utilities; Property Stock Records	1	16+	16+	16+
Army Regulation 735-35 Procedures for TOE & TDA Units or Activities	6	11-16+	14.5	14.5
Technical Manual 38-750 Army Equipment Record Procedures	18	8.5-16+	14.5	12.8

Table 2

Readability Scores for Army Publications in MOS 94B: Cook

Publication	Number of Pages Sampled	Range of Grade Difficulty Levels (Flesch Formula)	Average Grade Level (Flesch)	(Dale-Chall)
Technical Manual 10-412-6 Army Recipes, Desserts	33	8.5-14.5	11	7.5
Technical Manual 10-405 Army Mess Operations	13	8.5-14.5	14.5	14.0
Technical Manual 10-401 The Army Food Advisor	4	11-14.5	14.5	11.5
Technical Manual 10-410 Bread Baking	16	11-16+	14.5	11.5
Technical Manual 10-418 Meat Processing, Ration Issue	13	7-14.5	11	7.5
Technical Manual 10-411 Pastry Baking	14	7-11	11	11.5

right of Figure 1 presents the median reading ability of non-new standards men. These reading ability data are from the OASD/M&R report (1) which summarizes data concerning Project 100,000. These reading scores were obtained using a different test (Metropolitan Achievement Test-Intermediate Level) than used in the present research to assess the skill levels of the men in the various MOSs. The similarity of assessed reading skill levels obtained with the two different tests under widely differing circumstances suggests that the estimates of reading skills

Table 3

Readability Scores for Army Publications in MOS 91A: Medical Corpsman

Publication	Number of Pages Sampled	Range of Grade Difficulty Levels (Flesch Formula)	Average Grade Level (Flesch)	(Dale-Chall)
Technical Manual 8-230 Medical Corpsman & Medical Specialist	39	6-16+	11	11.5
Field Manual 8-50 Bandages & Splints	7	7-11	8.5	9.5
Field Manual 21-11 First Aid for Soldiers	9	7-14.5	8.5	9.5

Table 4

Readability Scores for Army Publications in MOS 11E: Armor Crewman

Publication	Number of Pages Sampled	Range of Grade Difficulty Levels (Flesch Formula)	Average Grade Level (Flesch)	(Dale-Chall)
Field Manual 17-12 Tank Gunnery	22	11-16+	14.5	13.8
Technical Manual 9-2350-215-10 Operator's Manual	27	8.5-16+	14.5	11.5
Training Circular 17-6 Tank Leader's Guide	12	6-16+	11*	9.5
Training Circular 17-4 Tank Gunner's Guide	11	6-8.5	7*	5.5
Training Circular 17-5 Tank Driver's Guide	15	6-10.5	7*	9.5

*These manuals were designed, for the most part, by the staff of HumRRO Division No. 2 (Armor) in conjunction with Work Unit SHOCKACTION in 1957 and 1958.

Table 5

Readability Scores for Army Publications in MOS 63C: General Vehicle Mechanic

Publication	Number of Pages Sampled	Range of Grade Difficulty Levels (Flesch Formula)	Average Grade Level (Flesch)	(Dale-Chall)
Technical Manual 9-2320-209-20 Organizational Maintenance Manual	42	7-16+	14.5	12.8
Technical Manual 9-2350-215-20 Organizational Maintenance Manual	33	8.5-16+	14.5	12.8
Technical Manual 78-350 Equipment Record Procedures	25	14.5-16+	14.5	14.0

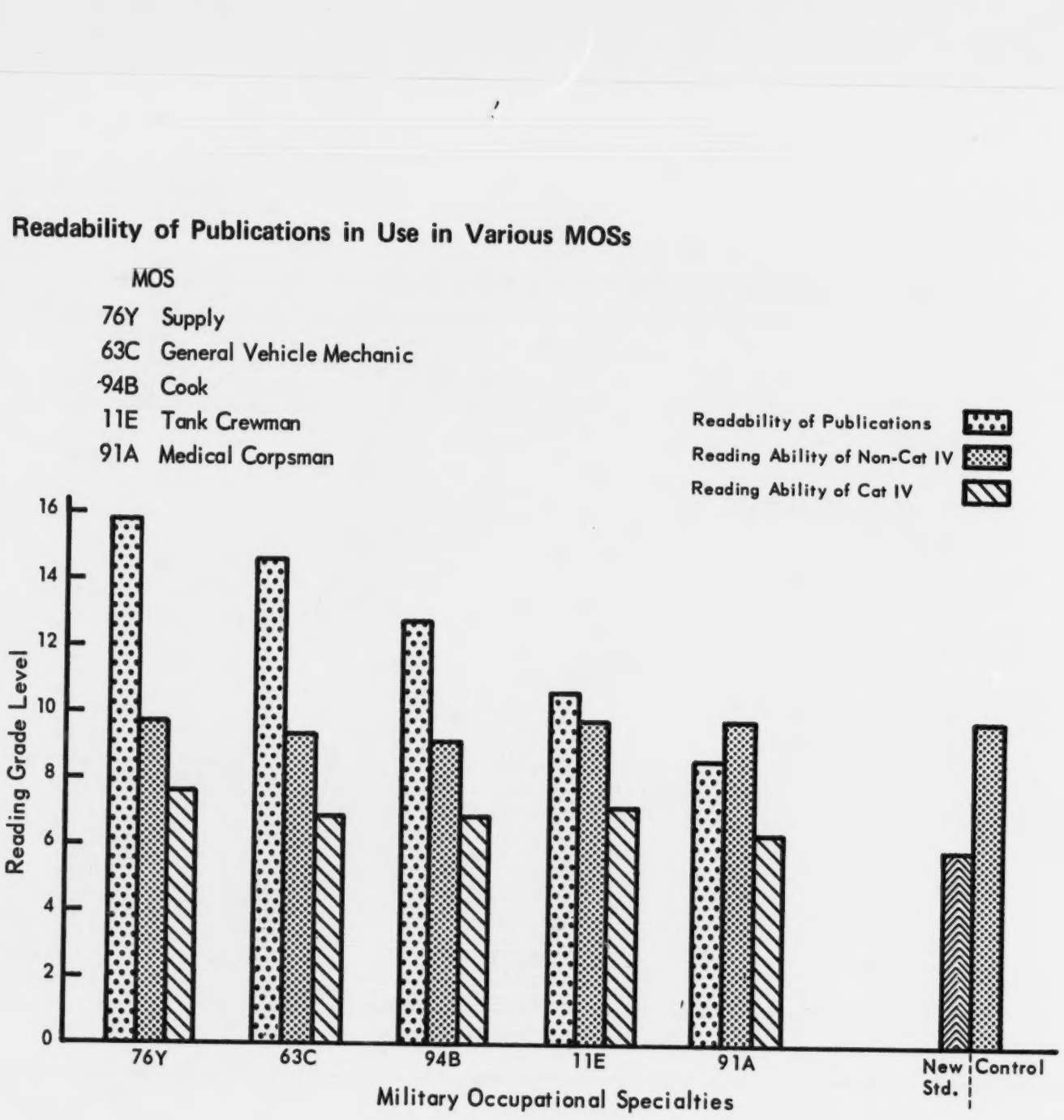

Figure 1

for each MOS presented in Figure 1 are accurate estimates, even though the number of men included in the present analyses is small.

Readability and Reading Ability

The differences between readability of publications and reading ability of men found in most of the examined MOSs are important only if materials are actually more difficult to comprehend where the gap is greater between reading ability and readability.

Data relevant to this proposition are available from prior research on Work Unit REALISTIC (6). In that study, 96 Army inductees were administered reading comprehension tests having passages of either 6.5, 7.5, or 14.5 grade level of difficulty as estimated by the modified Flesch formula of Farr, *et al.* (2). The men read each test passage and then answered "fill-in-the-blank" questions demanding recall of factual information from the reading selections.

For the purposes of this paper, the data for 20 men having AFQT scores of 70 or above, and 20 men having AFQT scores within the range of 10-20 (New Standards) were selected from the data for the 96 men previously tested. The extremes on the aptitude continuum were selected so as to maximize the differences (indicated in Figure 1) in reading abilities between the two aptitude groups. For each group, the average percent correct scores for the grade 6.5, 7.5, and 14.5 reading sub-tests were computed. These data are presented in Figure 2. The figure indicates that the reading level of the material, as assessed by the modified Flesch formula used in the present study to evaluate the readability of Army publications, does affect the ability of both high and low aptitude readers to comprehend the materials. Analysis of variance indicated that the differences in reading comprehension as a function of both readability and mental aptitude level were highly significant ($p<.001$), while the interaction of these two variables was not significant.

Decrease in Reading Comprehension of High and Low Subjects With Increase in Reading Difficulty Level

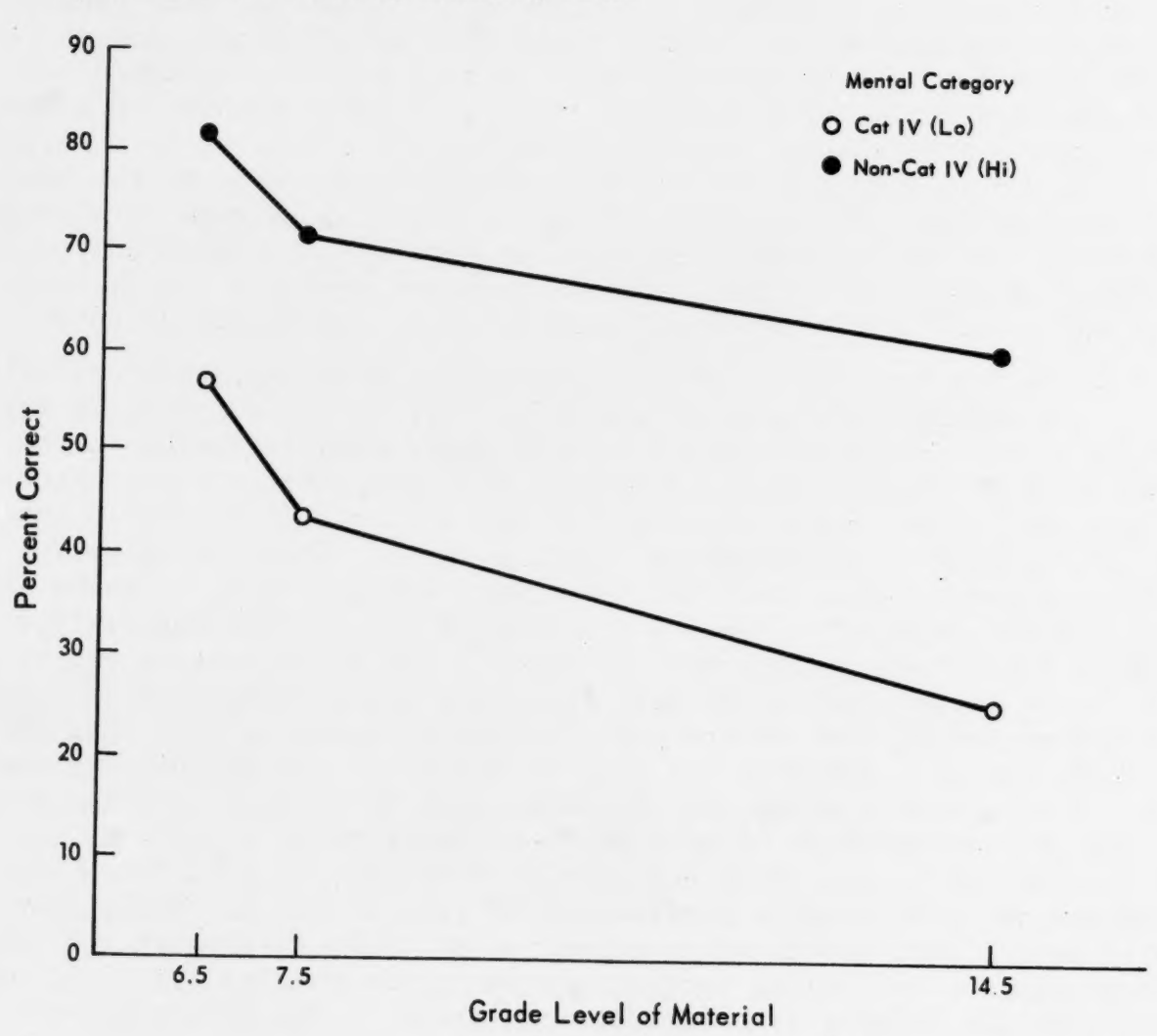

Figure 2

These data suggest that the differences between the readability of the materials in Figure 1 and the reading abilities of the personnel in the MOSs are a matter of concern because, in general, the larger the gap between readability and reading ability, the less comprehensible the materials are likely to be for the man on the job.

Readability and Literacy Requirements

As mentioned earlier, the readability formulas provide only an *estimate* of the difficulty level of materials. The grade levels of reading ability estimated by the formulas are not precise indicators of the literacy skills required to comprehend or otherwise use the publications. This is so because, for one thing, it is not possible at the present time to specify exactly what skills and knowledges are included in, for instance, 10th grade reading ability, and so forth. Secondly, the fact that the forumlas have validity coefficients of about .70 for predicting the performance of *school children* on reading comprehension tests indicates that they can account for only roughly 50% of the variability in reading performance of *children*, and it is likely that they may account for even less variability in *adult* performance, especially with material containing large numbers of technical terms with which persons trained on the job are likely to be familiar, but which would increase the estimate of difficulty made by the readability formulas. The imprecision of the formulas is even more understandable when it is remembered that the formulas are based only upon stylistic factors of writing, such as word and sentence length, and deal not at all with many content, structural, and format factors.

Despite the limitations of the readability formulas, they are still useful as objective indices of the difficulty level of materials for adults, and such indices may be used to order jobs according to the gross reading ability required to cope with the materials encountered on the job. Also, while the formulas are not accurate or valid enough to set absolute requirements for reading skills, they can be useful in making judgments about such requirements. For instance, it seems likely that persons scoring at the 6th grade level on standard survey-type reading achievement tests, such as used in the present study and by the U.S. Armed Forces Institute, will encounter great difficulty in reading and understanding most of the publications reviewed in MOSs 76Y, 63C and 94B, and will not fare too well on the materials in MOSs 11E and 91A. A 6th grade reading ability would seem to be necessary for even a labored comprehension of most of these materials. If this is so, and if the ability to use these and similar materials is considered *necessary* for the satisfactory performance of jobs within the MOSs, then it would appear that any literacy selection or training program not geared to securing or instilling better than 6th grade reading skills is unrealistic for dealing with current Army needs in the MOSs studied.

Readability Formulas for Quality Control of Publications

As indicated by this research, readability formulas can be used to check the difficulty levels of existing materials which are suspected of being too difficult for general use in training or on the job. Such formulas can also be used as quality control techniques for checking to insure that materials in preparation are being constructed at a reasonable level of difficulty for the target user population. In this regard, Smith and Senter (7) report that an index they have developed, the Automated Readability Index, provides for the mechanical tabulation of the readability of a manuscript. In their technique, impulses from a standard typewriter activate counters that record the number of letters, words, and sentences contained in the passage. From this, the average word length and average sentence length are computed. Appropriate weightings of these factors result in an index reflecting the readability of the passage which is in close agreement with other indices of readability. A computerized technique for obtaining readability indices of books or articles that are sent by punched paper tape (or punched into cards) is described by Fang (8).

If materials, such as technical manuals, contain a large number of technical terms, and the manuals are intended for use by a specialized group educated and trained in the recognition and use of the technical terms, then the readability formulas may tend to overestimate reading difficulty. However, a question of concern is to what extent Army publications may be considered to be used by persons trained in recognizing and using the technical terms in the publications. At this time, a quantitative answer to this question is not available. Qualitative, informal information has suggested to many who prepare manuals, and who have studied Army training, that a number of the Technical Manuals, Field Manuals, and so forth, are used to provide on-the-job *training* of men (9). Thus, the materials are frequently put into the hands of *untrained* men, many of whom, as we have seen, are very poor readers. Under these circumstances, the readability formulas may better serve to indicate the reading difficulty of the material.

Appendix A presents procedures and materials for obtaining Flesch readability scores. In the interpretation of results from readability analysis, special attention should be paid to the above discussion regarding possible differences in *effective* reading difficulty for training and operational applications.

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APPENDIX

LITERATURE CITED

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APPENDIX A

This Appendix describes procedures for estimating the reading difficulty of publications by the Flesch and Dale-Chall readability formulas. The procedures and materials are taken largely from Mowry, Webb, and Garvin (5).

I. The Flesch Formula

Flesch (4) presents a Reading Ease Score formula which takes account of (a) the average number of words in sentences, and (b) word length expressed in number of one-syllable words per 100 words. The formula yields a range of scores from 0 to 100. The score of 100 on the Reading Ease Score would correspond to very easy reading. Conversion tables based on empirical research are presented to permit the translation of the readability scores to school grade levels.

The procedure for obtaining the Reading Ease Score is given below. If the reading section is brief, apply the formula to the entire selection. For more lengthy selections, samples are appropriate.

STEP I: Choosing the sample.

For samples, generally three or four samples of a short manual or a 10% sample of the pages in a large piece of writing is sufficient. Where possible, avoid introductory paragraphs for they are usually not typical of the whole material.

Sub-samples of 100 words are taken from each sampled page. Samples should start at the beginning of a paragraph. Words include numbers, letters, symbols, and groups of letters that are surrounded by white spaces. Hyphenated words and contractions are counted as one word. As an example, each of the following is counted as one word: "couldn't", "F.O.B.", "i.e.", "$32,008", "second-grade."

STEP II: Obtain the average sentence length.

The next step is to obtain the average number of words in the sentences of the sample chosen. If an entire piece of writing is taken, then count all the sentences and divide the number of words by the number of sentences. For instance, if there are 192 words, and 10 sentences, the average sentence length is 19, (rounding the results).

When 100-word samples are used, count the number of sentences in each sample; add the number of sentences in all samples and divide the number

of words by the total number of sentences. For example, with two 100-word samples having 6 and 10 sentences respectively, the average sentence length, in words per sentence, would be obtained by dividing 200 by 16. In the 100-word sample, the 100-word mark may fall in the middle of a sentence. If the 100-word mark falls after more than half of the words in the sentence, it becomes part of the sample, otherwise it is not included. Count as sentences each unit of thought that can be considered grammatically independent of another sentence or clause, if its end is marked by a period, question mark, exclamation point, semi-colon, or colon. Count as a sentence, fragments of incomplete sentences. As an illustration, count as two sentences the following: "Where is the motor sergeant?" "Home." Count as three sentences: "The equipment is old because: (a) It was issued several years ago. (b) it needs constant repair. (c) we have no spare parts for it." Count as two sentences: Conclusion: Permission granted. Count as one sentence: Three tanks met at the appointed time: Alpha, Bravo, and Charlie.

STEP III: Count the one-syllable words.

If a whole piece of writing is being considered, count the number of one-syllable words in every 100 words in the material. The 100-word samples are combined into one Reading Ease Score. After obtaining the number of one-syllable words for every 100 words, proceed the same as if 100-word samples of only part of the material were being taken.

When 100-word samples are used, calculate the number of one-syllable words per sample. If, for example, three 100-word samples are to be combined into one Reading Ease Score, sum the number of one-syllable words in the three samples and divide by the number of samples. For example, if three samples contained 40, 30 and 55 one-syllable words each, one would divide the sum of these three figures (125) by the number of 100-word samples, here three, for the result of 42 (rounding off). This would then be the average number of one-syllable words in the three samples.

Count syllables the way the word is pronounced: such as "row" has one syllable, "mention" has two. With symbols and figures the syllables are known by the way they are normally read aloud, such as, one syllable for ¢ ("cents"), three for R.F.D. ("are-eff-dee"), and four for 1918 ("nineteen eighteen"). When in doubt about syllables, consult a dictionary.

STEP IV: Getting the Score.

With the average sentence length, and the number of one-syllable words per 100 now available, the Reading Ease Score can be obtained quite easily from Table A-I. The table displays the average sentence length listed on the top horizontal row, and the number of one-syllable words per 100 words in the left-hand vertical column. The Reading Ease Score will be given at the point of intersection of the row and column

entries. For example, if a sample of 100 words has an average sentence length of 25 words and has 70 one-syllable words, the Reading Ease Score is 55.

Table A-1[a]

Flesch Reading Ease Index Table

Number of one-syllable words per hundred words	Average sentence length																												
	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38
84	94	93	92	91	90	89	88	87	86	85	83	82	81	80	79	78	77	76	75	74	73	72	71	70	69	68	67	66	65	64
82	90	89	88	87	86	85	84	83	82	81	80	79	78	77	76	75	74	73	72	71	70	69	68	67	66	65	64	63	62	61
80	87	86	85	84	83	82	81	80	79	78	77	76	75	74	73	72	71	70	69	68	67	66	65	64	63	61	60	59	58	57
78	84	83	82	81	80	79	78	77	76	75	74	73	72	71	70	69	68	67	66	65	64	63	62	61	60	59	58	57	56	55
76	81	80	79	78	77	76	75	74	73	72	71	70	69	68	67	66	65	64	63	62	61	60	59	58	57	56	55	54	53	52
74	78	77	76	75	74	72	71	70	69	68	67	66	65	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48
72	74	73	72	71	70	69	68	67	66	65	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45
70	72	71	70	69	68	67	66	65	64	63	61	60	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43	42
68	68	67	66	65	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43	42	41	40	39
66	65	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43	42	41	40	38	37	36	35
64	61	60	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32
62	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29
60	56	55	54	53	52	50	49	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26
58	52	51	50	49	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25	24	23
56	49	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29	27	26	25	24	23	22	21	20	19
54	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16
52	42	41	40	38	38	37	36	35	34	33	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13
50	40	39	38	37	35	34	33	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10
48	36	35	34	33	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7
46	33	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	13	12	11	10	9	8	7	6	5	4	3
44	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	
42	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	2	1				
40	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1							
38	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1										
36	17	16	15	14	13	12	11	10	9	8	7	6	5	4	2	1	1													
34	13	12	11	10	9	8	7	6	5	4	3	2	1																	

[a]Permission to use this copyrighted material has been granted. The Table is from "Simplification of Flesch Reading Ease Formula," by J.N. Farr, J.J. Jenkins, and D.G. Paterson, in *Journal of Applied Psychology*, October 1951, published by the American Psychological Association.

STEP V: Interpretation of the Reading Ease Score.

To interpret the Reading Ease Score, consult Table A-2 which translates the Reading Ease Score into grade level. The table indicates that a Reading Ease Score of 55 would be equivalent to the grades 10-12, or high school level.

Table A-2

Grade Estimate From Flesch Reading Ease Score

Score	Grade Level of Difficulty[a]
90–100	5
80– 89	6
70– 79	7
60– 69	8 and 9
50– 59	10–12
30– 49	13–16
0– 29	College Graduate

[a]For the first four grades, scores above 100 can be used for estimating grade levels figuring roughly five points for each grade.

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13. ABSTRACT

The reading difficulty levels of publications in five MOSs were determined by means of the Flesch and Dale-Chall readability formulas. The readability levels of the publications were compared with the reading abilities of low and average mental aptitude men working in the MOSs. The comparison indicates that, in all MOSs, the average readability level of the publications exceeded the average reading abilities of the low aptitude men by from two to eight years. In all but one MOS, the average readability of the publications exceeded the average reading ability of the average mental aptitude men by from one to six years. Evidence is presented to suggest that both high and low aptitude readers are hurt when the reading difficulty of materials is increased. An Appendix describes procedures for using the Flesch index of readability.

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14. KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
Job Skill Requirements						
Literacy						
Manual Design						
Readability						
Reading Ability						

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